REMARKS

Favorable reconsideration and allowance of the present application are respectfully requested. Claims 1-10 are pending in the present application with claims 1, 5, and 10 being independent. Claims 5-10 have been added by this amendment, which do not add any new subject matter.

Drawings

Applicant submits herewith a replacement sheet. Accordingly, withdrawal of the rejection to the drawings is respectfully requested.

Specification

The Examiner objected to the specification because of minor informalities. Applicant submits herewith a substitute specification, correcting these minor informalities and in an effort to place the specification into proper form for U.S. patent practice. Applicant respectfully submits that no new subject matter has been added by this substitute specification.

Claim Objections

The Examiner objected to claims 1-4 because of minor informalities. Applicant has amended the claims in an effort to place them into proper form for U.S. patent practice. Accordingly, withdrawal of the objection to the claims is respectfully requested.

Claim Rejection under 35 U.S.C. § 112

The Examiner rejected claims 1-4 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. This rejection is respectfully traversed.

Applicant has amended the claims in an effort to correct a few minor informalities and in an effort to overcome the rejection.

Accordingly, withdrawal of the rejection is respectfully requested.

New Claims 5-10

New claims 5-10 should be considered allowable at least because the cited art fails to teach or suggest the combination of elements including the feature "wherein the weighting filter function for the measuring signal of the demodulator is formed by cascaded filter functions of the receive filter and the measuring filter," as recited in independent claims 5 and 10.

Conclusion

In view of the above amendments and remarks, this application appears to be in condition for allowance and the Examiner is, therefore, requested to reexamine the application and pass the claims to issue.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Martin R. Geissler (Reg. No. 51,011) at the telephone number of the undersigned below, to conduct an

interview in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a one (1) month extension of time for filing a reply in connection with the present application, and the required fee of $110.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
James T. Eller, Jr. #39,538

JTE/MRG/jao/tm/csm
4100-0127P

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

Attachment: Substitute Specification, incl. Abstract
Marked-Up Version of the Original Specification
Replacement Drawing (1)

MARKED-UP VERSION OF THE ORIGINAL SPECIFICATION

ARRANGEMENT FOR MEASUREMENT DEMODULATION AND MODULATION ERROR MEASUREMENT OF A DIGITALLY MODULATED RECEIVED SIGNAL

~~**The invention concerns and is based on an arrangement according to the preamble of the main claim.**~~

[0001] This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/EP00/10063 which has an International filing date of October 12, 2000, which designated the United States of America.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] **The present invention relates to an arrangement for measurement demodulation and modulation error measurement of a digitally modulated receive signal.**

2. Description of the Background Art

[0003] Measuring arrangements of this type are known (ETSI Tdoc SMG2 829/99, Meyr, Moeneclaey, Fechtel: "Digital Communication Receivers", WILEY INC, New York, 1997). They are used for modulation error measurement on digitally modulated receive signals. For data transmission in modern digital transmission technology, so-called digital modulation modes, which are known in many different variants, are used. The most frequently used modulation modes are the so-called PSK, QAM, MSK or FSK modulation methods. For data transmission, special transmit and receive filters are required at the transmitting and receiving ends, respectively, in order to achieve time intervals for the demodulation of the data, that are free of inter-symbol interference. For measurement purposes, special weighting filters have to be used in the receive

path, instead of the receive filter.

[0004] Figure 1 shows a known filter arrangement that is suitable for this purpose. The PSK modulated measuring signal, for example, passes after frequency conversion, not shown, A/D conversion and, if required, digital mixing, to the input of the measuring arrangement as a complex baseband signal. Receive filtering in a receive filter **1** (matched filter) initially takes place at this point, and in the following demodulator 2 signal errors such as mean frequency errors, initial phase errors, mean timing errors and the like are detected and eliminated. Furthermore, a symbol decision stage is provided in the demodulator 2, which generates the symbol samples of an ideal, reconstructed transmit signal from the error-free measuring signal, for example by quantisation of the IQ data, the phase or absolute value. The signal is then filtered by means of a reference filter 13. The reference filter 13 has the characteristic: reference filter = TX filter* weighting filter.

[0005] (Here the symbol "*" is used as a convolution operator and signifies convolution of the filter pulse responses in the time domain; both in the time domain and in the frequency domain the filter design itself can be achieved analytically and with approximation methods).

[0006] In this case the TX filter is the pulse-shaping filter used at the transmitting end of the respective transmission system~~, the~~**. A** weighting filter **11** is a filter that is specified according to the weighting standard. The input signal to be weighted in the weighting filter 11 is first delayed in a memory 9 and error-corrected in an error-correction stage 10 that is connected to the demodulator 2, and is then fed to the weighting filter 11. This weighting filter 11 is designed in accordance with the desired weighting function, for example in accordance with the ETSI specification. The ideal signal of the reference filter 13 and the weighted receive signal of the weighting filter **11** is then passed on to a following evaluation circuit 4 for further error detection, and finally to a display circuit 5 in which, in addition to the detected numerical modulation errors, measuring or reference signals as well as error signals derived from them, are numerically or graphically displayed. For further error detection in the evaluation circuit 4, for example, by comparing the two signals, further modulation errors, for example, error vector

magnitude, magnitude error, phase error, respectively, are determined symbol-by-symbol or over a specific measurement period.

[0007] In the known arrangement, the original input signal has to be temporarily stored in a memory for later weighting filtering, and additional arithmetic operations are necessary for error correction of the original input signal prior to its weighting.

SUMMARY OF THE INVENTION

[0008] It is therefore an ~~The~~ object of the present invention ~~is~~ to simplify an arrangement of this type with regard to construction and computing effort.

~~Based on an arrangement according to the preamble of the main claim, this object is achieved by its characterising features. Advantageous developments are revealed in the sub-claims.~~

[0009] In the arrangement according to the invention a buffer memory is superfluous, so are additional arithmetic operations for error correction. The corrected output signal of the demodulator is directly employed for weighting filtering.

[0010] **Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.**

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] **The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus, are not limitive of the present invention, and wherein:**

[0012] Fig. 1 is a schematic illustration of a conventional filter arrangement; and

[0013] Fig. 2 is a schematic illustration according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION

[0014] The invention is explained in further detail below with the aid of an exemplary embodiment in Figure 2.

[0015] In the arrangement according to the invention in Figure 2, the input signal is ~~again~~ filtered in a receive filter ~~1(RX~~ **20 (RX** filter) as is required by ~~the~~ **a** following demodulator ~~2~~ **21**. The receive filter ~~1~~ **20** can be designed, for example, so that ISI-free samples can be fed to the following demodulator ~~2~~ **21**. If a so-called Viterbi demodulator is used as demodulator, for example, ~~this~~ **the** receive filter ~~1 is~~ **20 can be** matched to its demodulation characteristics. After detection and compensation of specific signal errors in the demodulator ~~2~~ **21**, a symbol decision stage of the demodulator ~~2~~ **21** determines the ideal symbol samples from the error-corrected measuring signal. After these ideal symbol samples have undergone pulse shaping, these are ~~again~~ fed to ~~the~~ **an** evaluation circuit 4 **24** via a reference filter ~~13~~ **23** having the same characteristics as in the known arrangement in Figure 1.

[0016] In contrast to the arrangement shown in Fig. 1, the ~~errorcorrected~~ **error corrected** measuring signal of the demodulator ~~2~~ **21** is directly fed to a measuring filter ~~12~~ **22,** which has the following characteristic or approximation, respectively, within the permissible measurement tolerance:

weighting filter = receive filter* measuring filter

[0017] In the arrangement according to the invention the desired weighting filter characteristic, which meets the ETSI specification, for example, is therefore obtained by the cascaded filter characteristics of the receive filter ~~1~~ **20** and the measuring filter ~~12~~ **22**, thus making an additional buffer memory superfluous, and the additional arithmetic operations for error correction, as are necessary in the known arrangement are also superfluous. The already error-corrected output signal of the demodulator ~~2~~ **21** is used for the weighting filtering. In this

arrangement the measuring filter ~~12~~ **22** can also be made more simple, since the filter function of the preceding receive filter **23** is already taken into account in the weighting filtering. The output of the measuring filter ~~12~~ **22** is ~~again~~ connected to the evaluation circuit ~~4,~~ **24, for** further evaluation ~~being effected~~ as in the known arrangement shown in Figure 1. **Then, an output of the evaluation circuit 24 is displayed on a display circuit 25.**

[0018] **The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are to be included within the scope of the following claims.**

~~**Claims**~~

What is claimed is:

~~Abstract~~ ABSTRACT

~~In an~~ **An** arrangement for measurement demodulation and modulation error measurement of a digitally modulated receive signal, which has a receive filter ~~(1)~~ and a following demodulator ~~(2)~~ for error compensation and for determining the ideal symbol samples~~, and in which the~~**. The** measuring signal that is filtered in a reference filter ~~(13)~~ and weighting filtered is **then** evaluated in a following evaluation circuit~~(4), the~~**. The** output signal of the demodulator ~~(2)~~ is fed via a measuring filter ~~(12)~~ to the evaluation circuit ~~(4)~~ and the weighting filter function is formed by ~~the~~ cascaded filter functions of the receiver filter and measuring filter.

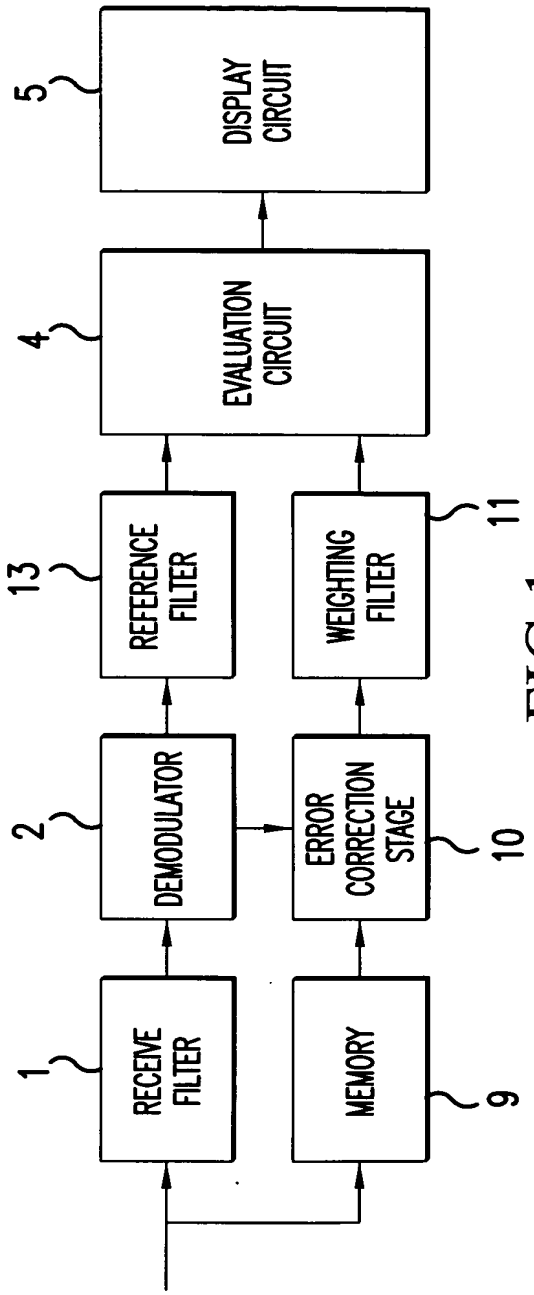

FIG.1

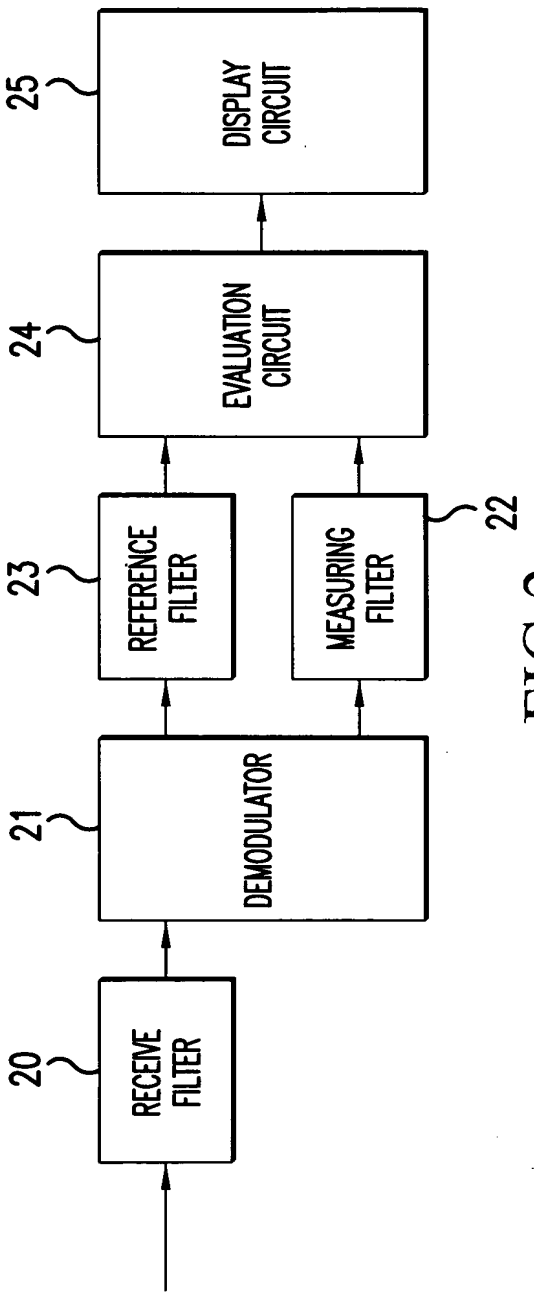

FIG.2

AMENDMENTS TO THE DRAWINGS

Attached hereto is one (1) sheet of corrected formal drawings that comply with the provisions of 37 C.F.R. § 1.84. The corrected formal drawing incorporates the following drawing changes:

Labels have been added to all elements of each drawing figure (Figs. 1 and 2).

It is respectfully requested that the corrected formal drawing be approved and made a part of the record of the above-identified application.

AMENDMENTS TO THE SPECIFICATION

In The Abstract Of The Disclosure:

Please replace the Abstract of the Disclosure currently of record with the attached new Abstract of the Disclosure.

In The Specification:

Please replace the specification currently of record with the Substitute Specification attached hereto.